

The use of the biconical Challier-Laveissiere trap impregnated with Deltamethrine against glossina

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RÉSUMÉ

Utilisation du piège biconique Challier-Laveissière imprégné de Deltaméthrine contre les glossines

Un essai de lutte anti tsé-tsé a été fait sur 13 km de galerie forestière au sud de la zone guinéenne sur le ranch de la Marahoué (*). Une série de pièges biconiques CHALLIER-LAVEISSIÈRE modifiés et imprégnés de Deltaméthrine en poudre mouillable à 2,5 p. 100 ont été placés à 100 m environ l'un de l'autre.

En 16 jours, la réduction de la population (réduction corrigée par rapport à la dynamique des populations d'une rivière témoin) a atteint 98,1 p. 100 pour *G. palpalis* spp., 98 p. 100 pour *G. longipalpis* et 42 p. 100 pour celles du groupe *fusca*. A la fin de l'expérience, 62 jours pour plus tard, les réductions respectives étaient de 100 p. 100, 97 p. 100 et 77,7 p. 100.

Les avantages les plus intéressants de la méthode sont : la simplicité, l'absence d'effets néfastes sur le milieu et un prix de revient inférieur aux autres méthodes.

INTRODUCTION

For many years tsetse flies have been successfully controlled by either ground- or aerial application of insecticides (6). Since during the last years the production costs for both aviation fuel and insecticides have soared, this operations become difficult to be economically justified. Cheaper methods to achieve the same goal, control of Glossina, must be developed, particularly in view of smaller operations i.e. on ranches, settlement schemes and for the control of human trypanosomiasis.

LAVEISSIERE (3, 5) has shown, that impregnated traps achieve very similar reduction like aerial applications and within almost the same period of time.

The aim of our experiment was to see if :

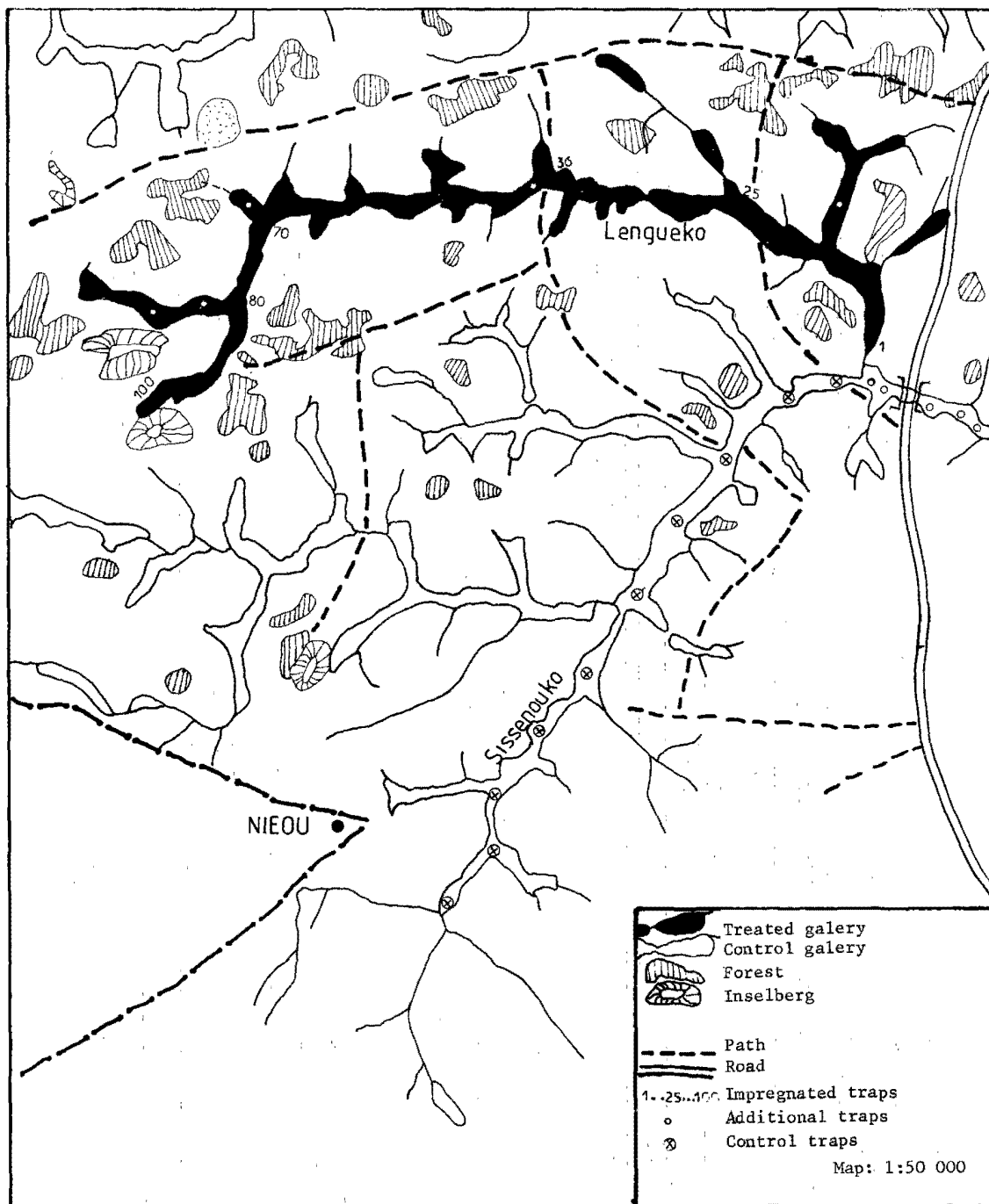
1. other species than *G. palpalis* and *G. tachinoides* can be controlled,
2. this control can also be achieved with lower densities of flies and
3. in larger more ramified gallery forests.

MATERIAL AND METHOD

In early March 1981, modified CHALLIER-LAVEISSIERE traps (2, 4) were impregnated with 400 mg a.i. Deltamethrin 2,5 p. 100 wettable powder in a metal recipient measuring $1,0 \times 1,0 \times 0,4$ meters. The absorbing capa-

(*) NDLR. Le ranch de la Marahoué est situé à environ 120 km, à vol d'oiseau, à l'Ouest de Katiola (Côte-d'Ivoire).

Il a une superficie de 82 300 ha, est limité à l'Est par la rivière Marahoué et au Sud par la route reliant Mankono à Séguéla.



RANCH DE LA MARAHOUE

POSITION OF TRAPS

city of the traps was tested and is approximately 500 ml per trap, but may vary with the kind of tissue and the climatic conditions during the impregnation. After soaking, the traps were dried and the run off solution sprayed onto the surface of the traps. Cotton-balls were used to prevent the central axe from perforating the upper cone of the trap.

Trap positions were marked and the traps put up along the Lengueko river from its confluence with the Sissenouko to the source. The distance between the traps was approximately 100-150 meters, depending on the suitability of the terrain. The ground around the traps was carefully cleaned for up to 5 meters by cutting grass and bush. The lower end of

the trap was not more than 20 cm from the ground. Regrowth of bush and grass around the trap positions was regularly removed.

The observations lasted due to the onset of the rains only for 62 days. Chemical analysis of the residues were carried out by the laboratory for ecology, Korhogo, at weekly intervals. For reasons unknown the results are not interpretable and therefore left out.

In order to measure the decline of the populations in the treated river, traps 1, 10, 20 etc. were ordinary non treated CHALLIER-LAVEISSIERE traps (1). One trap every kilometer was also used for control purposes along the Sissenouko and at time intervals as shows in graphs 1-3 control catches were made. For this purpose, the cages were put onto the cones of all control traps in both rivers on one day and the catch counted 48 hours later. Thereafter, the cages were again removed.

Prior to the actual experiment, the density per 10 traps and 2 days was measured several times and the average density (a.d.) calculated (s. Tab. 1).

TABLE N°I-Average densities per 10 traps during 48 hours on 3 occasions

River	<i>G. palpalis</i> spp.	<i>G. longipalpis</i>	group <i>fusca</i>
Lengueko	36,3	31,6	23,7
Sissenouko	41,5	15,0	11,0

G. tachinoides and *G. morsitans* were present in insignificant densities of less than 1 and 2,3 respectively and therefore not taken into consideration.

The corrected percentage of reduction (in relation to the control river) was calculated with the following formula :

$$\frac{E_i \cdot \frac{C_t}{C_i} - E_t}{E_i \cdot \frac{C_t}{C_i}} \cdot 100$$

Thereby being :

E_i = initial a.d. treated river

E_t = a.d. treated river on day X

C_i = initial a.d. control river

C_t = a.d. control river on day X

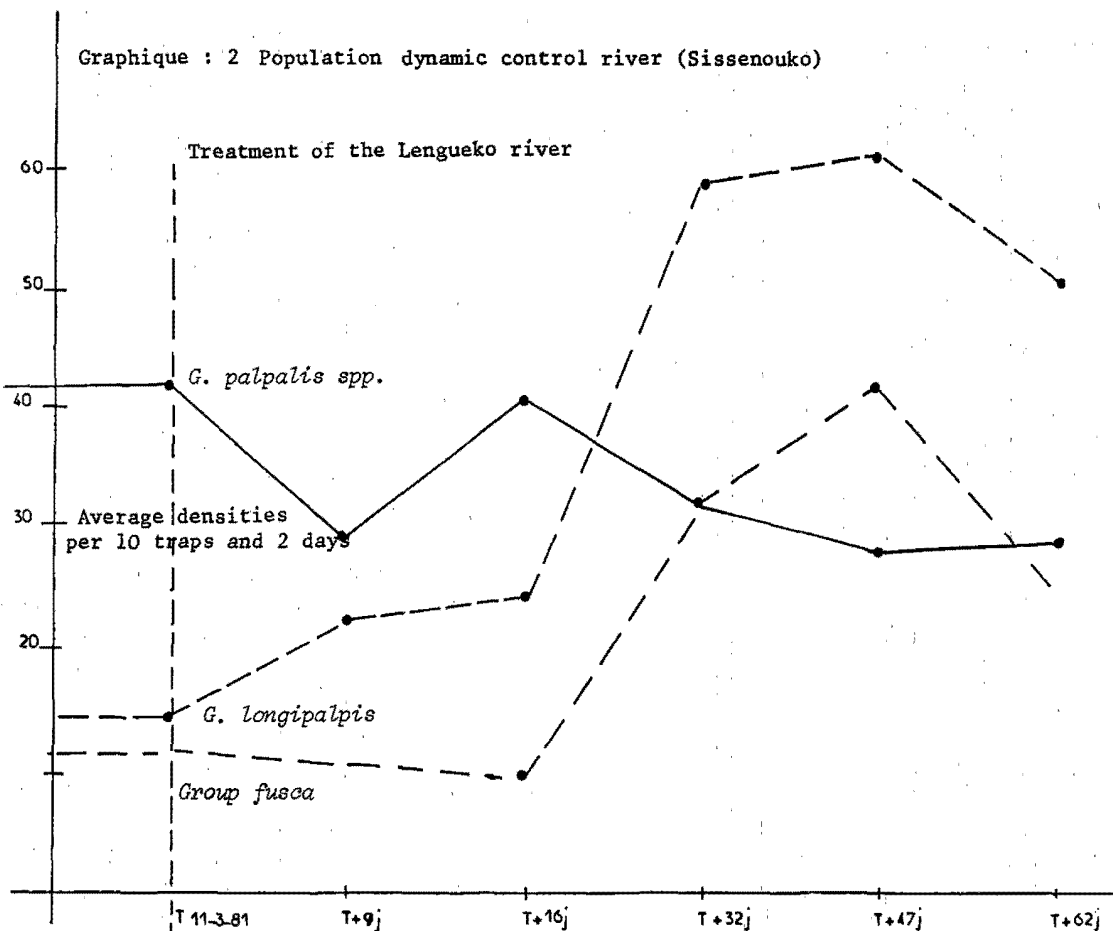
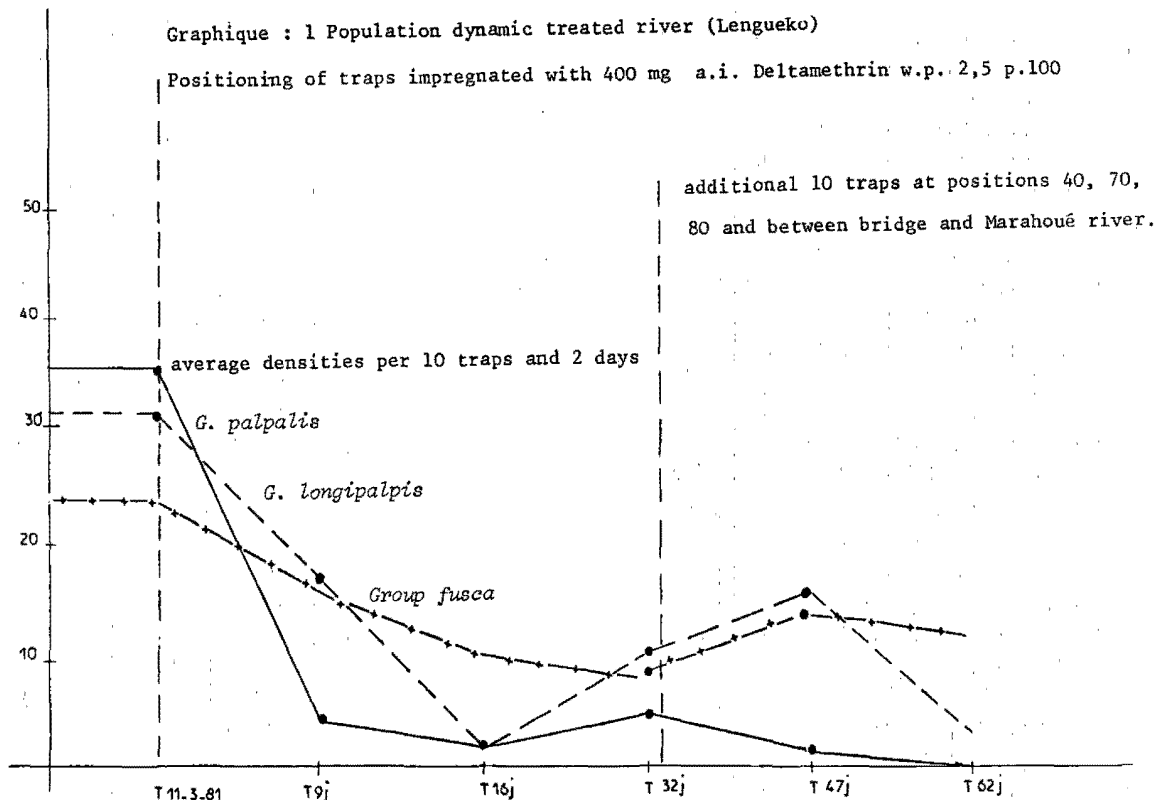
RESULTS AND DISCUSSION

Glossina palpalis spp.

From graphs 1 and 2 can be seen, that there was an almost identical density in both rivers of 36,3 in the Lengueko and of 41,5 flies in the Sissenouko (s. tabl. 1). 9 days after the treatment we observed a sharp decline in the treated river in which the reduction is 89 p. 100 or 84,2 p. 100 if corrected in relation to the natural evolution in the control river (s. graph 3 and tabl. 2). This decline continues and reaches 97,2 p. 100 or 98,1 p. 100 respectively on day 16. On the following occasion, 32 days after the treatment a slight population increase is observed and the reduction drops to 86,2 p. 100 or 82,4 p. 100 corrected. The field record card for this day reveals catches in the treated river at positions 1 (3 flies), 40 and 80 (1 fly each). This increase was certainly due to reinvasions from the main river, the Marahoué, and from non treated small affluents near trap positions 40 and 80. It was therefore decided, to place 10 additional treated traps at these positions as well as between the confluence of Lengueko/Sissenouko and Marahoué river. At the following capture, 47 days after the treatment, the reduction was again 97,2 p. 100 or 96,9 p. 100 respectively and reached 100 p. 100 on day 62. Three month after the beginning 2 flies were caught once more again at positions 1 and 10, most likely reinvaded from the Marahoué. The experiment was then abandoned due to the onset of the rains.

Glossina longipalpis

This species becomes rather a gallery-fly during the hot dry season. The average density at the beginning was 31,6 in the treated river and 15 in the control river respectively (s. tabl. 1). We observed a first reduction of 46,2 p. 100 and 63,4 p. 100 corrected, 9 days after the treatment (s. graph. 3 and tabl. 2), followed by a further reduction to 98,8 p. 100 or 98,0 p. 100 respectively on day 16. As observed for *G. palpalis* there is a slight recovery to a reduction of 68,4 p. 100 or 92,0 p. 100 respectively 32 days later (emergence of pupae ?). This is followed by a further recovery to a reduction of 49,4 p. 100 or 88,1 p. 100 respectively on day 47. At the end of the experiment, the reduction reaches



Graphique : 3 Corrected percentage of reduction

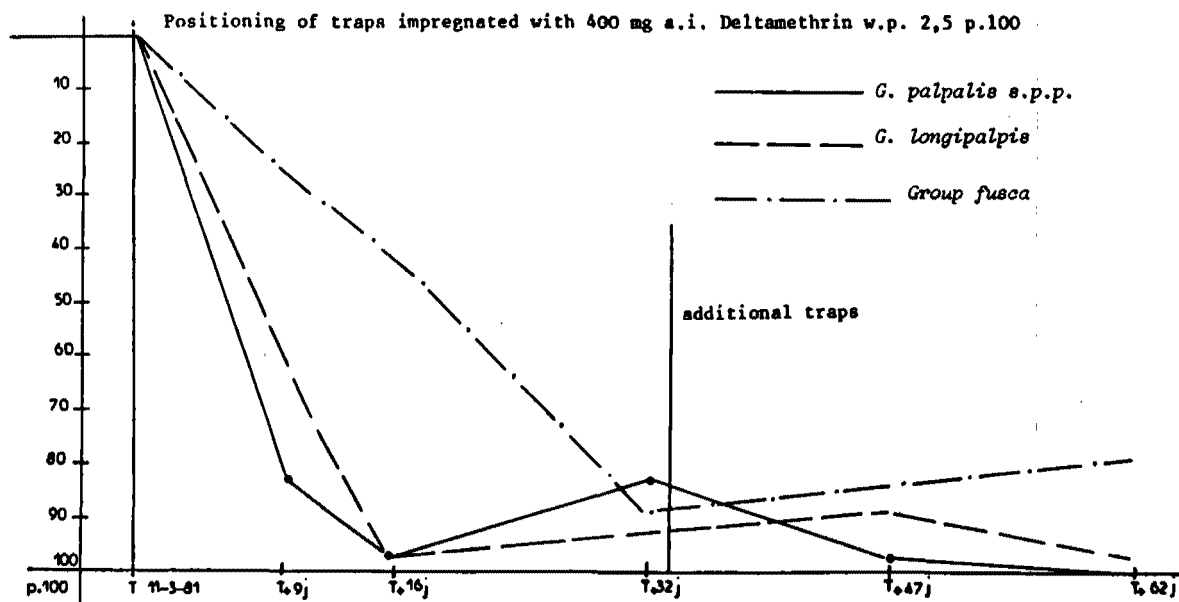


TABLE N°2-Reductions of fly-populations

	T + 9		T + 16		T + 32		T + 47		T + 62	
	r	rc	r	rc	r	rc	r	rc	r	rc
<i>G. palpalis</i> spp.	89	84,2	97,2	98,1	86,2	82,4	97,2	96,9	100	
<i>G. longipalpis</i>	46,2	63,4	98,8	98,0	68,4	92,0	49,4	88,1	90,5	97,2
<i>G. group fusca</i>	32,5	25,7	57,8	42,0	66,2	89,1	40,9	84,5	49,4	77,7

r = reduction ; rc = reduction corrected.

again 90,5 p. 100 or 97,2 p. 100 respectively. Three month after the beginning, only 10 flies could be caught compared to the initial average of 31,6.

Group fusca

Two species of this group were present in both rivers, *G. fusca fusca* and *G. medicorum* in a proportion of 1 : 3. For our purpose, both were considered one.

In both rivers, there was an original density of 23,7 and 11,0 respectively (s. tabl. 1). The reduction went from 32,5 p. 100 or 25,7 p. 100 respectively on day 9 (s. graph. 3 and tabl. 2), to 57,8 p. 100 or 42,0 p. 100 on day 16, and continued to reach 66,2 p. 100 or 89,1 p. 100 respectively 32 days later. On the following catch, 47 days later, the population had slightly recovered, but the reduction was still 40,9 p. 100 or 84,5 p. 100 respectively, to

arrive ultimately at 49,4 p. 100 or 77,7 p. 100 respectively on day 62.

Glossina tachinoides was present only in insignificant numbers and disappeared entirely after the impregnated traps were in position.

Glossina morsitans submorsitans was regularly caught, but showed a very irregular behavioural pattern. Clearly, this species depends even less on shade and humidity than does *G. longipalpis* and is only temporarily caught in the gallery forest.

It appears that the modified impregnated CHALLIER-LAVEISSIERE trap can well help to control *Glossina* species.

In the case of *G. palpalis* spp., the reduction was strikingly similar to the one reported by LAVEISSIERE (3, 5) and reaches quickly over 90 p. 100. Attention must be paid to reinvasions from mainstreams or in the case of large streams from up- and downstream. The

control of such reinvasions could probably be achieved with some kind of barrier, consisting of perhaps 20 to 30 treated traps over a distance of 2 to 3 kilometers.

It also appeared that good control over *G. longipalpis* was achieved in the gallery forest, although the main targets were riverine species. With treated traps along the edge of the gallery forest and around woodlands, satisfactory control of this savanna-species might be obtainable.

Group fusca seemed not to be attracted nor caught by the CHALLIER-LAVEISSIERE trap the way *G. palpalis* or even *G. longipalpis* are attracted and caught. There is a steady decline during the first 32 days, but not as

sharp as observed for *G. palpalis* and *G. longipalpis*. This can be due to the relatively late activity of this species, or this species requires a higher dose of Deltamethrin to be killed.

CONCLUSION

The authors feel that the use of insecticide impregnated traps is practicable and certainly useful in areas where expensive aerial applications are economically not justified (7).

Larger intervals between the traps should be tried to reduce costs and labour.

The possibility to replace traps by cloth screens should also be studied.

SUMMARY

13 km of gallery forest on the Ranch de la Marahoué, in the southern guinea zone of the Ivory Coast (8°15'N and 6°15'-6°30'W) were treated with Deltamethrin impregnated CHALLIER-LAVEISSIERE traps (2). Glossina species present were *Glossina palpalis* spp., *G. tachinoides*, *G. morsitans submorsitans*, *G. longipalpis*, *G. fusca fusca* and *G. medicorum*.

The interval between traps was 100 meters. Within 16 days the population reduction (corrected in relation to the populations-dynamic in a control river) reached 98,1 p. 100 for *G. palpalis* spp., 98,0 p. 100 for *G. longipalpis* and 42,0 p. 100 for *Group fusca* flies. At the end of the experiment, 62 days later, the respective reductions were 100 p. 100, 97,2 p. 100 and 77,7 p. 100.

The marked advantages are lower costs, lack of harmful side effects against aquatic and terrestrial fauna and its simplicity.

The method seems to be very useful for smaller tsetse control schemes and in human sleeping sickness foci, though longer intervals between traps should be tested to minimize costs and labour.

RESUMEN

Utilización de la matamoscas Challier-Laveissière impregnada de Deltametrina contra las glosinas

Se efectuó un ensayo de lucha contra la mosca tse-tse en 13 km de galería forestal del rancho de la Marahué, al sur de la zona guineana.

Se colocaron a 100 m uno de otro una serie de matamoscas bicónicas Challier-Laveissière modificadas e impregnadas con Deltametrina de polvo mojable a 2,5 p. 100.

En 16 días, la reducción de la población (reducción corregida con relación a la dinámica de las poblaciones de un río testigo) llegó a 98,1 p. 100 por *G. palpalis* spp., 98 p. 100 por *G. longipalpis* y 42 p. 100 por las del grupo *fusca*. Al fin de la experiencia, 62 días más tarde, las reducciones respectivas eran de 100 p. 100, 97 p. 100 y 77,7 p. 100.

Las ventajas más interesantes del método son: la sencillez, la ausencia de efectos nefastos sobre el medio y un precio de coste inferior al de otros métodos.

BIBLIOGRAPHIE

1. CHALLIER (A.), LAVEISSIERE (C.). Un nouveau piège pour la capture des glossines: description et essai sur le terrain. *Cah. ORSTOM sér. Ent. méd. Parasit.*, 1973, 11 (4): 251-262.
2. LAVEISSIERE (C.). Description et détails de la construction du piège biconique utilisé pour la lutte contre les glossines riveraines. 1979 a (WHO/VBC/79.746).

3. LAVEISSIÈRE (C.). Essai de lutte contre les glossines riveraines à l'aide de pièges imprégnés d'insecticide en zone de savane humide.
2^e partie : Résultats quantitatifs. Doc. Tech. OCCGE. 1979 b, N° 7251.
4. LAVEISSIÈRE (C.). Le piège biconique utilisé à grande échelle contre les glossines riveraines. 1980, N° 19/Oncho/Rap. 80.
5. LAVEISSIÈRE (C.) et al. Lutte contre les glossines riveraines à l'aide de pièges biconiques imprégnés d'insecticide en zone de savane humide. 4. Expérimentation à grande échelle. 5. Note de synthèse. *Cah. ORSTOM, sér. Ent. méd. Parasit.*, 1981, **19** (1) : 41-54.
6. MACLENNAN (K. J. R.). Tsetse transmitted trypanosomiasis in relation to the rural economy in Africa. Part I and II. 1981. *Wld. anim. Rev.*, F.A.O., 1981 (36) : 2-17 ; (37) : 9-19.
7. RYAN (L.), MOLYNEUX (D. H.), KUZOE (F. A. S.), BALDRY (D. A. T.). Traps to control and estimate populations of *Glossina* species. *Trop. med. Parasit.*, 1981, **32** : 145-148.